

SHELL CLEANING AND EPIPHRAGM REMOVAL BY *TRIODOPSIS ALBOLABRIS* (SAY)

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The included data show that the land snail, *Triodopsis albolabris* (Say), will on occasion spend a considerable period removing foreign material from the surface of its shell. The removal of the epiphragm terminating aestivation is also described. The included information is based on observations of specimens collected during the last week in August 1940 on the Edmund Niles Huyck Preserve, Rensselaerville, Albany County, New York.

SHELL CLEANING—The 15 specimens upon which these observations are based were transported to Cornell University, and in January 1941 were moved to the zoological laboratory of Mills College where the shell cleaning occurred.

The snails were placed in a terrarium supplied with a covering of black loam soil planted with Wandering Jew. Soon after the snails were transferred to the terrarium it was observed that the loam soil often became caked on their shells, and occasionally accumulated in such quantity that the suture lines were obscured. The initial cleaning action was noted after the snails had been in the terrarium 2 months. One snail was first observed greatly extended with its anterior foot region curved over the dorsal shell surface. On close examination its lips were observed moving, and the soil covering the shell could be seen being filed away through the action of the radula. The soil was not scraped off and dropped by the snail, but was carried into its alimentary canal. Continued observation of the 15 snails showed that on occasion all were scraping soil from their shells.

One snail continued cleaning the surface of its shell for 75 minutes. This individual was especially active in removing soil which had become caked in the shell sutures. Its posterior foot region, about one-third of the total length of the foot, held the animal on one upright wall of the terrarium. The remainder of the foot was stretched back over the shell as far as the apex. The individual was seen to be moving its head slowly along the

sutures with its lips continually in motion. The cleaned shell areas stood out in bold contrast to the uncleaned shell portions. The great extensibility of the foot allowed this snail to move its head around the apex; considerable time was spent in ridding the apex of the accumulated soil.

Other snails were observed lying on the bottom of the terrarium with the foot held free of the substratum. In such a position they would twist and turn their heads about, filing at their fouled shells. One area which was continually cleaned was the umbilical region.

The fecal strings of snails which had but recently cleaned their shells of accumulated soil were commonly black in color; on occasion fecal masses were sprinkled with black spots. The dark colored soil in the fecal strings was easily distinguishable, for due to the snails' lettuce diet green colored scats were produced. If shell cleaning does occur in the natural habitat of this species the observer would not likely be able to detect the presence of soil in the fecal strings without a careful examination, for the soil color would blend in with the typical dark green to dark brown and greyish-black fecal strings which are characteristically deposited by this snail species under natural conditions.

Such shell cleaning employed by *T. albolabris* if carried on in its natural environment would probably reduce shell corrosion. Extensive corrosion of the apical whorls if continuous might expose vital parts. Thus soil removal in riding the shell of accumulated soil and organic matter possibly enhances the survival rate of individuals to some slight degree. Collected data indicate that under natural conditions soil probably does not accumulate on shells to any great extent. Of 500 shells of living snails, *T. albolabris*, examined only 11 individuals collected during the summer of 1940 on the Huyek preserve had badly fouled shells; 8 of the 11 were taken from a flood plain beneath water carried debris piles resting on loam soil. All but 3 specimens from beech-hemlock, beech-maple, and maple areas had clean appearing shells. Under the humus-log habitat in the above forest areas snails are not directly associated with a soil substratum; thus situated, soil would not accumulate to any great extent on the shell.

Two other species of snails, *Mesomphix cupreus* (Raf.) and *Helicodiscus parallelus* (Say), were kept in the same terrarium with *T. albolabris*. Individuals of these two species were never observed cleaning their shells. Five specimens of the former species possessed corroded apical whorls after 2 months; the apical whorls were without noticeable corrosion when they were placed in the terrarium. The 2 individuals of *Helicodiscus* did not have corroded shells at the end of the same period.

EPIPHRAGM REMOVAL—Five individuals form the basis for these observations. They were forced into aestivation by removing all moisture from their container through the medium of cotton. They were allowed to remain aestivating for 72 days. They were then returned to a moist container with food consisting of apple, carrot, and carrot leaves. One hour after they had been transferred to the more favorable situation they had commenced to break through the epiphragm.

Concerning epiphragm removal by land snails in general after hibernation Binney (1885) writes, “. . . the animal breaks down and devours the membraneous partitions [epiphragms] and comes forth to participate in the warmth and freshness of the season. At first it is weak and inactive, but, recovering in a short time its appetite, resumes its former activity.” Binney does not state in detail how epiphragm removal is accomplished. The feat of a snail ridding itself of this resistant membrane warrants a complete description of the removal process.

In the 5 individuals observed pressure by the posterior tip of the foot initiated the removal process. The foot tip was brought into contact with the epiphragm and by continual pressure was finally thrust through it at the columellar region. When the foot emerged it carried a portion of the epiphragm with it and left an opening through which the remainder of the snail's foot and the head could make an exit. The time taken by the foot to pierce the membrane after it had made contact varied from 1 to 2 minutes.

After the foot had torn a part of the epiphragm away the remainder was left attached at the lip of the shell around the aperture. As the anterior body region of the snail continued to emerge still more of the adhering epiphragm was carried away. As the head appeared it was brought in contact with the epi-

phragm, and soon the mouthparts of the snail were observed fling away at the epiphragm remnants. Each of the 5 snails began a systematic cutting away the epiphragm at the lip region opposite the columella. As the fragments were torn away in this region the snail continued its feeding around the aperture lip until all the membrane had been cleared away. Then the snail moved its head into the interior of the body whorl just behind the lip and began cleaning the internal shell surface. This done the snail thrust the mantle, which had until up to this time been held back from the lip, forward into its normal position and began to crawl over the substratum. The time taken to clean the epiphragm away and to explore body whorl behind the lip varied from 5 to 10 minutes in the 5 individuals.

The weakness which exists in snails just emerging from hibernation as reported by Binney¹ (1885) was not noticeable in these snails emerging from aestivation. Generally speaking hibernating snails go through a dormant period from approximately 4 to 7 months, and a weakness can be readily understood. However, the five 72 day aestivating snails immediately began to feed on the provided food supply.

In summarizing the mechanics of epiphragm removal both the foot and the radula are employed. Evidence indicates that the part of the epiphragm that is cut away by the radula is swallowed by the snail.

NOTES AND NEWS

We have to record the death at the age of 78 of FRANK HARVEY ENO, of Columbus, Ohio, on August 7th of last year. Professor Eno's vocation was civil engineering, but as a hobby he was interested in mollusks.

PRECEDENCE.—Before the idea came to Dr. Merrill Moore, in fact just a little short of one hundred years ago, Fredricka Bremer, the traveler and writer, wrote home to Sweden from Philadelphia: "There is a beautiful museum [here] of stuffed birds and other animals, with collections of shells and minerals, where the diseased mind may divert itself and derive instruction."—CALVIN GOODRICH.

¹ Manual of American Land Shells, Bull. 28, U. S. Nat. Mus.